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The Impact of Exports, Imports, and the Exchange Rate on Algeria's Economic Growth

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Abstract. *This study examines the impact of foreign trade on economic growth in Algeria over the period 1980-2023. The main objective is to analyze the influence of exports, imports, and the exchange rate on economic growth to understand better the country's trade dynamics and their implications for economic growth. The analysis is based on annual data from official sources such as the World Bank, the World Development Indicators, Algeria's National Office of Statistics (ONS), and the Ministry of Finance. The methodology relies on a rigorous econometric approach based on time series analysis. First, the Augmented Dickey-Fuller (ADF) test is applied to examine the stationarity of the series and avoid spurious regression issues. Then, Johansen's cointegration test is used to identify long-term links between the variables. Cointegration justifies estimating a VECM model, which analyzes short-term adjustments and long-term equilibrium dynamics. Additionally, a Granger causality test is conducted to determine the directional effects between foreign trade and economic growth. Finally, several diagnostic tests are performed to validate the robustness of the model, including tests for residual normality, autocorrelation, and model stability. The empirical results reveal contrasting effects. Imports positively impact economic growth in the medium term, fostering industrialization and improving local productive capacities through acquiring capital goods and technologies. In contrast, exports, primarily dominated by the hydrocarbon sector, show a limited and negative effect in the long term, highlighting the vulnerability of Algeria's economic model to commodity price volatility. The exchange rate has a favourable influence on growth, particularly by facilitating the importation of strategic goods and enhancing the country's attractiveness to foreign investors.*

Keywords: *economic growth, exportation, importation, exchange rate, cointegration.*

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Вплив експорту, імпорту та обмінного курсу на економічне зростання Алжиру

Анотація. *У цьому дослідженні розглядається вплив зовнішньої торгівлі на економічне зростання в Алжирі протягом 1980-2023 років. Основна мета полягає в аналізі впливу експорту, імпорту та обмінного курсу на економічне зростання, щоб краще зрозуміти динаміку торгівлі країни та її наслідки для економічного зростання. Аналіз базується на щорічних даних з офіційних джерел, таких як Індикатори розвитку підготовлені Світовим банком, Національне бюро статистики (ONS) Алжиру та Міністерство фінансів. Методологія базується на строгому економетричному підході на основі аналізу часових рядів. По-перше, розширений тест Дікі-Фуллера (ADF) застосовується для перевірки стаціонарності ряду та уникнення помилкових проблем регресії. Потім коінтеграційний тест Йогансена використовується для визначення довгострокових зв'язків між змінними. Коінтеграція виправдовує оцінку моделі VECM, яка аналізує короткострокові коригування та довгострокову динаміку рівноваги. Крім того, тест причинності Грейнджера проводиться для визначення спрямованих ефектів між зовнішньою торгівлею та економічним зростанням. Нарешті, кілька діагностичних тестів виконуються для підтвердження стійкості моделі, включаючи тести на залишкову нормальність, автокореляцію та стабільність моделі. Емпіричні результати вказують на контрастні ефекти. Зокрема, імпорт позитивно впливає на економічне зростання в середньостроковій перспективі, сприяючи індустріалізації та покращенню місцевих виробничих можливостей шляхом придбання капітальних товарів і технологій. Навпаки, експорт, у якому переважно домінує вуглеводневий сектор, має обмежений і негативний ефект у довгостроковій перспективі, підкреслюючи вразливість економічної моделі Алжиру до коливань цін на сировину. Обмінний курс сприятливо впливає на зростання, зокрема, сприяючи імпорту стратегічних товарів і посилюючи привабливість країни для іноземних інвесторів.*

Ключові слова: *економічне зростання, експорт, імпорт, валютний курс, коінтеграція.*

INTRODUCTION

Foreign trade plays a fundamental role in nations' economic growth dynamics. It is a key driver of development by enabling countries to access new markets, enhance their competitiveness, and benefit from technology and capital transfers. In a rapidly globalizing world, trade is no longer limited to exchanging goods and services but extends to foreign investments, global value chains, and international financial flows. For developing economies, particularly Algeria, foreign trade represents a strategic lever for economic diversification, strengthening the balance of payments and stimulating productive investment. However, Algeria's current export structure, which is heavily dominated by hydrocarbons, makes the country highly vulnerable to international market fluctuations, raising concerns about the long-term impact of foreign trade on economic growth.

Globally, foreign trade has undergone significant transformations in recent decades. According to data from the World Trade Organization (WTO), the share of trade in global economic growth increased from 20% in 1995 to 31% in 2022 before declining to 29% in 2023 due to a slowdown in merchandise trade. This contraction is mainly attributed to geopolitical tensions, supply chain disruptions, and rising logistics costs. In 2023, global trade volume fell by -1.2%, while global economic growth remained at 2.7%. However, the World Bank forecasts a recovery, with projected growth of 2.6% in 2024 and 3.3% in 2025, highlighting the strong interdependence between international trade and economic growth.

In Algeria, foreign trade constitutes a vital component of economic growth, although it remains heavily reliant on hydrocarbons. In 2022, Algerian exports reached 68.4 billion USD, marking a 76.4% increase compared to 2021, primarily due to soaring oil and gas prices. Hydrocarbons accounted for 89.8% of total exports, including 41% from natural gas, 30.3% from crude oil, and 15.4% from refined products. Meanwhile, imports stood at 35.9 billion USD, down 3.6% from the previous year. This trade balance resulted in a 32.4 billion USD surplus, reversing previous years' trade deficits.

However, this performance remains cyclical and highly dependent on hydrocarbon prices, posing a risk of economic imbalance in the event of a market downturn.

The importance of foreign trade for Algeria's economic growth is undeniable, yet its actual contribution remains uncertain due to several structural constraints. The lack of export diversification and dependence on imports are major challenges. Despite a trade surplus in 2022, Algeria continues to import a significant share of its essential goods, including food products (16% of imports), industrial equipment (10.9%), plastic products (7.3%), and electrical equipment (5.1%). The country's main trading partners include China (18.6%), France (14%), and Italy (7.7%). This reliance on imports reflects the low competitiveness of local industries and the limited development of non-hydrocarbon exports, hindering foreign trade's role in fostering sustainable and balanced economic growth.

Algeria's recent economic history also demonstrates that the impact of foreign trade on growth has varied across different periods. For instance, the 2015 oil crisis, marked by a sharp decline in oil prices, exacerbated the trade deficit and highlighted the economy's vulnerability to external shocks. Conversely, the 2000-2008 period was characterized by strong economic growth driven by high export revenues, enabling Algeria to accumulate substantial foreign exchange reserves and finance major infrastructure projects. These fluctuations underscore the need to rethink Algeria's economic model to enhance resilience and maximize the benefits of foreign trade.

In this context, this research aims to analyze the impact of foreign trade on economic growth in Algeria using a Vector Error Correction Model (VECM). This model will help examine the interactions between key macroeconomic variables, including exports, imports, economic growth, and the exchange rate, to identify both short-term and long-term effects of foreign trade on economic growth. By considering recent global trade trends and Algeria's economic dynamics, this study will provide an in-depth analysis of the key determinants of foreign trade and their implications for the country's economic policies.

The main objective of this study is to address a crucial question: To what extent does foreign trade contribute to economic growth in Algeria? By analyzing data spanning from 1980 to 2023, this research seeks to provide concrete insights and strategic recommendations for policymakers and economic stakeholders. Specifically, it will explore ways to enhance export diversification, optimize trade policies, and strengthen the competitiveness of the national production system. Better integration into global value chains and promotion of non-hydrocarbon exports will be crucial in ensuring more stable and sustainable economic growth for Algeria in the coming years.

LITERATURE REVIEW

This section summarizes the various studies conducted on the relationship between foreign trade and economic growth, and the following sections are devoted to our practical case.

The study by Liu et al. (2009) empirically examines the interaction between exports, imports, foreign direct investment (FDI), and economic growth for nine Asian economies by conducting multivariate causality tests within a Vector Error Correction Model (VECM) framework. The results reveal bidirectional causal links between trade, incoming FDI, inbound mergers and acquisitions (M&A), and economic growth for most sampled economies. A unidirectional causal link exists between M&A and growth and trade. These findings suggest that export expansion, import liberalization, FDI inflows, and inbound M&A are integral to the growth process of Asian economies.

The study by Kehinde et al. (2012) demonstrates that increased participation in global trade helps Nigeria benefit from the static and dynamic advantages of international trade despite the inconsistency of the trade openness coefficient. The volume and structure of trade, favouring high-tech exports, positively affect the Nigerian economy. The authors recommend that the government implement an appropriate strategy to diversify the economy by promoting exports, encouraging FDI, and ensuring exchange rate stability to boost productivity and improve citizens' living standards. Afaha and Oluwatobi (2012) focus on the impact of trade on Nigeria's economic growth. They use multiple linear regression analysis to evaluate various components of foreign trade. The study utilizes data from the Central Bank of Nigeria (CBN), and regression analysis was conducted using E-Views software. The results show that exports, exchange rate, and per capita income are positively related to economic growth, while trade openness and imports negatively impact production (proxied by economic growth). The adjusted R^2 value is 0.99 for the period 1980-2010. The study concludes that the government should refine macroeconomic variables to create an enabling environment for foreign trade by increasing exports and reducing imports, which strain the economy.

Lin Guan and Hong (2012) used data from 1960 to 2010 to examine the relationship between U.S. foreign trade and economic growth. Granger causality tests indicate a bidirectional relationship between U.S. exports and economic growth, whereas imports have a unidirectional relationship with economic growth. This suggests that imports have not been a driving force behind U.S. economic growth. In other words, even with multiple measures to protect and reduce imports, the U.S. may not achieve its goal of promoting economic growth.

Boakye and Gyamfi (2017) explore the theoretical and empirical relationship between foreign trade and economic growth, which has been widely discussed in economics in recent years. Despite numerous studies, the link remains empirically weak. Their study aims to empirically examine this relationship using trade openness and the Ordinary Least Squares (OLS) method to estimate the impact of foreign trade on economic growth. The study analyzes the incidental relationship between foreign trade and economic growth in Ghana based on available data. The results highlight that all variables are statistically significant. The study recommends reinforcing trade liberalization as a policy measure.

Temiz Dinç et al. (2017) analyze the correlation between foreign trade and economic growth in selected developing countries, including Iran and Turkey, using econometric applications (panel cointegration methods and E-Views software) based on credible national data. Their study concludes that foreign trade positively impacts economic growth, resource allocation, energy consumption, green energy use, human capital development, and physical capital accumulation.

Agbahoungba and Thiam (2018) analyze the effects of international trade on the economic growth of ECOWAS countries. They use an augmented version of Solow's (1994) growth model, as adopted by Mankiw et al. (1992), to specify their model. The Generalized Method of Moments (GMM) is applied to a panel of 12 ECOWAS countries over the 1996-2016 period. The results indicate a negative and significant relationship between trade ratio and economic growth in ECOWAS, suggesting that the current level of foreign trade is not a proven driver of economic growth in the region. Regarding policy implications, the study recommends better participation in international trade, with an in-depth analysis of the structure of traded goods, mainly imports.

Nguyen (2020) evaluates the impact of FDI and international trade (exports and imports) on Vietnam's economic growth from 2000 to 2018. Secondary data were obtained from Vietnam's General Statistics Office. The OLS method is used to analyze the impact of FDI, exports, and imports on Vietnam's economic growth. Empirical results show that FDI and international trade contribute to economic growth. However, each economic variable has a different impact. FDI has a positive and statistically significant influence on Vietnam's economic growth. Exports also have a positive and significant impact, while imports have a negative but statistically insignificant effect. The findings are helpful for Vietnam's policymakers in shaping external economic relations. To enhance the impact of FDI and international trade on economic growth, the Vietnamese government should continue implementing preferential policies to attract FDI, focus on high-quality and efficient foreign investment, pursue an export-oriented policy, increase the value-added of exported goods, and regulate imported goods. Further trade liberalization should be pursued by signing and implementing international trade agreements.

The study by Karahan (2020) examines the sustainability of the current account deficit in Turkey for the quarterly data between 2003 and 2018. Besides, some policy implications are made to ensure the sustainability of the current account deficit in Turkey's economy. The dynamics related to the sustainability of the current account deficit are analyzed within the framework of the "intertemporal budget constraint approach" developed by Husted (1992). The long-term dynamics are empirically investigated using the Johansen cointegration test. Econometric analysis is also expanded within the framework of the Vector Error Model to reveal the short-term dynamics. Johansen's cointegration analysis suggests that current account income and expenses are integrated with the cointegrating coefficient of less than 1, implying that Turkey has a weak form of current account deficit sustainability. The Vector Error Correction model's findings confirm the long-run analysis results and indicate that deviations from the long-term equilibrium are corrected at a rate of 78% every quarter.

The study of Ndour and Faye (2021) aimed to bridge the gap in the literature on the relationship between international trade, economic growth and the environment by contributing to a new analysis by country. In this regard, the relationship between international trade and carbon (CO2) emissions was investigated by simultaneously checking the environmental Kuznets curve (EKC) hypothesis. From time series data over the period 1971–2016, our methodology relied on cointegration analysis with the Autoregressive Distributed Lag (ARDL) test approach. The results show that the intensity of international trade decreases CO2 emissions in Senegal. In addition, the analysis confirms the long-term U-shaped hypothesis between CO2 emissions and economic growth.

The paper of Aisen and Veiga (2013) aims to determine the effects of political instability on economic growth empirically. Using the system-GMM estimator for linear dynamic panel data models on a sample covering up to 169 countries and 5-year periods from 1960 to 2004, we find that higher degrees of political instability are associated with lower economic growth per capita growth rates. Regarding the transmission channels, they find that political instability adversely affects growth by lowering productivity growth rates and, to a smaller degree, physical and human capital accumulation. Finally, economic freedom and ethnic homogeneity benefit growth, while democracy may have a small negative effect.

Considering the results of previous studies, this study has the same objective: to analyze the relationship between foreign trade operations and economic growth in the Algerian economy from 1980 to 2023.

RESEARCH METHODOLOGY

The issue of foreign trade and economic growth has been at the forefront of economic discussions for centuries. Foreign trade facilitates the exchange of goods and services in the global market and serves as a driving force for economic growth in a country. Moreover, economic growth enhances production, employment opportunities, and overall well-being, which in turn can have a favourable impact on maintaining a positive trade balance. Economic growth is also key to a country's competitiveness in international markets.

This study aims to determine the impact of international trade on economic growth in Algeria using econometric tests and a Vector Error Correction Model (VECM) from 1980 to 2023, employing the EViews 8.0 software for analysis.

The data used for the analysis were collected from international databases, including the World Bank's national accounts data, World Development Indicators, Algeria's National Office of Statistics (NOS), and the Ministry of Finance. The dataset consists of annual

observations. We define the variables used in our empirical analysis as follows:

– Economic Growth: Represents Algeria's Gross Domestic Product.

– Exportation: Represents Algeria's exports of goods and services, measuring the value of all goods and services provided to the rest of the world.

– Importation: Represents Algeria's imports of goods and services, measuring the value of all goods and services acquired from the rest of the world.

– Exchange Rate: The official exchange rate (local currency units) as determined by national authorities or legally set by the exchange market.

Most previous studies have used the Granger causality test (1969) and the VECM model to analyze the impact of international trade on economic growth. According to Granger's representation theorem, the presence of cointegration in a system implies an error correction mechanism that prevents variables from deviating significantly from their long-term equilibrium. While cointegration identifies the existence and nature of the relationship between theoretically linked series, the error correction model captures and explains the underlying adjustment process that restores equilibrium (Lounes, 2012).

The choice of the cointegration method stems from the fact that many macroeconomic series are non-stationary. When conventional methods are applied, two main issues arise. First, there is the problem of spurious regressions, where an estimation using OLS may yield misleading results, falsely suggesting a significant relationship between non-stationary variables, as indicated by high R^2 and significant t-statistics (Bourbonnais, 2015). Second, financial and macroeconomic series often contain a unit root, meaning they are non-stationary and must be differenced to become stationary. A time series is said to be integrated of order d, denoted as I(d) if it needs to be differenced d times to achieve stationarity. In particular, most financial series are integrated of order one, I(1), meaning they become stationary after first-order differencing. Conversely, a series that does not require differencing follows an I(0) process, indicating its stationarity (De La Pallière, 1997).

The first step in our analysis involves checking the stationarity of variables using the Augmented Dickey-Fuller (ADF) test (1981). Next, Johansen's cointegration test (1988) is applied to assess long-term equilibrium relationships among variables.

Our model is based on prior literature examining the impact of international trade on economic growth. We specify the model with one endogenous variable (Economic Growth) and several exogenous multivariate variables (Importation, Exportation, Exchange Rate).

The VECM framework is employed to model the adjustments leading to long-term equilibrium while also accounting for short-term fluctuations. If cointegration is detected among the series, it indicates a long-term equilibrium relationship between them, justifying the application of the VECM model to assess the short-term properties of the cointegrated series. However, if no cointegration is found, the VECM model is no longer necessary, and we proceed directly with Granger causality tests to establish causal links between the variables.

In the VECM model, the cointegration rank indicates the number of cointegration vectors. For instance, a rank of two suggests that two linearly independent combinations of non-stationary variables are stationary. A negative and significant error correction term (ECM) coefficient indicates that short-term fluctuations between independent and dependent variables lead to a stable long-term relationship among the variables.

To conduct this analysis, we follow these steps:

– Analysis of variable stationarity through visual inspection, followed by the ADF test.

– Determining the optimal lag length based on Akaike (AIC) and Schwarz (SIC) criteria will be used for VECM estimation.

– Granger causality tests to determine causal relationships among the variables.

– Johansen's cointegration test to confirm the existence of long-term equilibrium relationships among variables, followed by the estimation of the VECM model.

– Validation of the model by testing for normality, autocorrelation, and stationarity of residuals.

RESULTS

In this section, we will apply econometric tests to determine the relationship between the endogenous variable and the exogenous variables and provide the necessary economic comments.

Descriptive Analysis of the Series

Descriptive statistics of the data allow us to gain insight into the level of risk and the evolution of these data over time. The Skewness, Kurtosis, and Jarque-Bera test statistics enable us to test the normality of the studied series. Table 1 presents the descriptive statistics of the series analyzed over the period (1980-2023).

Based on the results in Table 1, there is a variation between the minimum and maximum values for all the variables considered in this study. However, the largest variations concern the value of Economic Growth. Another observation is that all the variables' mean and median values are quite close in magnitude. Additionally, the studied variables exhibit fluctuations over time. Over the entire studied period, the Jarque-Bera test presents a very low value for the variable (Ln_IMPORT), confirming the normality of the data studied. Similarly, for each of the studied series, the "Skewness" and "Kurtosis" coefficients support the hypothesis of normality of the variables.

Table 1. Descriptive Statistics of the Studied Series

	LN_ECONOMIC GROWTH	LN_EXPORTATION	LN_EXCHANGE RATE	LN_IMPORTATION
Mean	8.080994	6.771949	3.613021	6.584535
Median	8.383078	7.363454	4.258520	6.751770
Maximum	10.42342	9.127882	4.955757	8.789899
Minimum	5.090722	3.566472	1.344817	3.530856
Standard deviation	1.692575	1.844079	1.226219	1.817435
Skewness	-0.409337	-0.483416	-0.832772	-0.325789
Kurtosis	1.758812	1.685883	2.068641	1.702021
Jaques-Bera	4.053086	4.879722	6.676027	3.867058
Probability	0.131790	0.087173	0.035507	0.144637

Source: Authors' data processed (2025).

Study of the Stationarity of the Series

Before modelling the relationships between variables, it is essential to verify their stationarity through appropriate tests to ensure the validity of long-term relationships in the model. Our study will apply the ADF test to assess the stationarity properties of the variable explaining economic growth and its fundamentals. There are several unit root tests, with the pioneering contributions in this field being those of Dickey and Fuller (1979, 1980). The Dickey-Fuller tests are parametric methods used to determine whether a time series is stationary by identifying the presence of a deterministic or stochastic trend. Based on the estimation of an autoregressive process, these tests help detect unit roots and ensure that the variables used in the model do not lead to spurious regressions (Lakhdar & Zohra, 2013). Table 2 provides the results of the stationarity test.

Table 2. Augmented Dickey-Fuller Test

ADF		Level	First Difference
		Prob	Prob
Ln Economic Growth	Intercept	0.3055	0.0008***
	Trend and intercept	0.9792	0.0013***
	None	0.9978	0.0065***
Ln Exportation	Intercept	0.6871	0.0001***
	Trend and intercept	0.9460	0.0004***
	None	0.9929	0.0000***
Ln Importation	Intercept	0.6022	0.0003***
	Trend and intercept	0.9856	0.0014***
	None	0.9434	0.0004***
Ln Exchange Rate	Intercept	0.2749	0.0021***
	Trend and intercept	0.9705	0.0056***
	None	0.7770	0.0008*

*, ** & *** refers to the rejection at 10%, 5% & 1%.
Source: Authors' data processed (2025).

The results show that the four variables are not stationary at this level. To make them stationary, we applied differencing. The ADF stationarity test results reveal that the variables Ln Economic Growth, Ln Exchange Rate, Ln Exports, and Ln Imports are stationary at first difference. We can suspect a potential cointegration between the variables.

Granger Causality Test (Short-term Causality)

The direction of economic causality is a crucial element in formulating economic policy or making forecasts. Consequently, to draw the necessary conclusions for Algeria, the confirmed cointegration of the four variables leads us to conduct a Granger causality test. To study the causality relationship in the Granger sense, we have series that are integrated of the same order I(1); thus, it is now necessary to test the null hypothesis of no causality against the alternative hypothesis of the existence of a causal link between the variables. The results of the test are presented in Table 3.

Table 3. Results of the Short-term Causality Link According to the Granger Procedure

Nul Hypothesis:	Obs	F-Statistic	Prob.
Ln Exportation does not Granger cause Ln Economic Growth	42	2.81766	0.0726
Ln Economic Growth does not Granger cause Ln Exportation		2.58060	0.0893
Ln Exchange Rate does not Granger cause Ln Economic Growth	42	1.98201	0.1522
Ln Economic Growth does not Granger cause Ln Exchange Rate		0.01747	0.9827
Ln Importation does not Granger cause Ln Economic Growth	42	1.60447	0.2147
Ln Economic Growth does not Granger cause Ln Importation		3.72550	0.0336

Source: Authors' data processed (2025).

This table shows that at a 5% significance level, the Granger test suggests a unidirectional causal link between Economic Growth and imports. In other words, in Algeria's case, Economic Growth drives the evolution of imports, not vice versa. This can be explained by the fact that an increase in economic growth, often linked to oil revenues, leads to a rise in domestic demand. This increased demand results in higher imports, particularly for consumer goods and equipment. On the other hand, imports are not a determining factor in economic growth, which could indicate a limited substitution by domestic production.

Moreover, at a 10% significance level, the test shows a bidirectional causal link between economic growth and exports in the short term. This means that economic growth influences exports, just as exports impact economic growth. On the one hand, an increase in economic growth stimulates national production, particularly in the hydrocarbon sector, thus boosting exports. On the other hand, exports, especially natural resources, generate foreign exchange revenues supporting investment and consumption, further fueling economic growth. However, this reciprocal relationship seems limited to the short term, which could be explained by Algeria's structural dependence on hydrocarbons and insufficient diversification of its productive base. Therefore, while exports and economic growth are closely linked, the short-term nature of this interaction suggests the need for economic strategies to strengthen non-hydrocarbon sectors to ensure sustainable growth.

In the short term, there is no significant relationship between economic growth and the exchange rate in Algeria, as the latter is primarily influenced by monetary policy and foreign exchange reserves rather than immediate economic fluctuations. However, in the long term, a relationship appears: economic growth can stabilize or strengthen the dinar by promoting production and economic attractiveness. At the same time, prolonged depreciation of the exchange rate may affect growth by increasing the cost of imports and impacting export competitiveness. In a hydrocarbon-dependent economy, this relationship is largely conditioned by fluctuations in oil revenues and the economic policies adopted to manage monetary stability.

Etude Study of Multivariate Cointegration (Johansen Approach)

Cointegration Test

When the variables are integrated at the first difference, it is necessary to check for the existence of a cointegration relationship between them to determine whether they share a common stochastic trend. If such a relationship exists, it implies the presence of a long-term equilibrium. To conduct this test, we first determine the optimal number of lags (P) by estimating a VAR model in levels using the non-stationary variables: Ln ECONOMIC GROWTH, Ln Inflation Rate, Ln Exchange Rate, Ln Imports, and Ln Exports. The selection of the appropriate lag length relies on statistical criteria such as the Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC or BIC - Bayesian Information Criterion), and Hannan-Quinn Criterion (HQ). These indicators are commonly used in time series analysis to identify the best-fitting model and avoid overfitting or underfitting issues (Galbraith & Zinde-Walsh, 2004). The information criteria LR, FPE, and AIC lead to the choice of lag (P = 2).

Table 4. Determination of the Number of Lags p

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-88.95117	NA	0.001095	4.534204	4.701381	4.595081
1	118.9132	365.0301	$9.48e^{-08}$	-4.825035	-3.989146*	-4.520650*
2	137.0485	28.30877*	$8.75e^{-08*}$	-4.929196*	-3.424596	-4.381304
3	149.0419	16.38117	$1.13e^{-07}$	-4.733750	-2.560439	-3.942350

Source: Authors' data processed (2025).

We then perform the Johansen test based on P=1. The results are gathered in the following table, provided by the EViews 12 software.

Table 5. Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. Of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.516483	55.61016	47.85613	0.0079
At most 1	0.293169	25.81672	29.79707	0.1343
At most 2	0.174297	11.59122	15.49471	0.1776
At most 3	0.087158	3.738912	3.841465	0.0532

Source: Authors' data processed (2025).

Table 6. Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. Of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.516483	29.79344	27.58434	0.0256
At most 1	0.293169	14.22550	21.13162	0.3468
At most 2	0.174297	7.852310	14.26460	0.3939
At most 3	0.087158	3.738912	3.841465	0.0532

Source: Authors' data processed (2025).

The observation of the cointegration test results shows that there is one cointegration relationship based on both the trace test and the max-eigenvalue test.

Trace Test

The Trace test allows testing the null hypothesis H0: there are r = cointegration relationships against the alternative, H1 there are r > k cointegration relationships. The analysis of the results in this table shows that the Johanson statistic related to the first eigenvalue is greater than the 5% threshold (55.61016 > 47.85613) at its critical value; therefore, we reject the null hypothesis that there are no cointegration relationships (R=0) at the 1% significance level. However, we accept the hypothesis (R=1) that there is at most one cointegration relationship between the variables of the model (25.81672 < 29.79707), as indicated in the second row of the table. Thus, we conclude that there is indeed one cointegration relationship between the variables.

Max-Eigenvalue Test

There is a cointegration relationship between the four variables of the model because the alternative hypothesis H1, which states that there is at least one cointegration relationship, was accepted (29.79344 > 27.58434). The null hypothesis, which states that there is no cointegration relationship between the model's variables, is rejected. Since the cointegration hypothesis is verified, we can conclude that this is a Vector Error Correction Model (VECM(1)).

Estimation of the Long-Term Relationship

The existence of a cointegration relationship between the variables allows us to determine the long-term relationship. Based on the cointegration test performed on EViews, a single long-term and short-term equation has been identified for our analysis. It takes the following form:

Ln ECONOMIC GROWTH = -0.555484.Ln Exchange rate + 0.961739.Ln Exportation – 1.492824.Ln Importation (1)

These results highlight certain economic dynamics specific to Algeria by analyzing the interactions between economic growth, the exchange rate, exports, and imports. Here is a detailed interpretation of the results in the Algerian context:

Exchange Rate

The results show a negative and significant relationship between economic growth and the exchange rate. A depreciation of the national currency (increase in the exchange rate) leads to a decrease in economic growth. This can be explained by Algeria's strong dependence on imports to meet domestic demand for consumer goods and equipment. A devaluation of the dinar increases the cost of imports, raising inflationary pressures and reducing purchasing power, which hampers economic growth. Furthermore, although depreciation could theoretically stimulate exports, this opportunity is limited in the Algerian context due to the concentration of exports in hydrocarbons, whose prices are determined on international markets. This result aligns with the findings of Ziadi and Abdallah (2007) and Haoudi and Rabhi (2020).

Exports

The results indicate a positive but not highly significant relationship between exports and economic growth. A 1% increase in exports leads to a 0.96% rise in economic growth. This result is consistent with Algeria's economic structure, where hydrocarbons account for the majority of exports and foreign exchange revenues. Hydrocarbon export increases directly stimulate economic growth by boosting tax revenues and funding public spending, such as subsidies and infrastructure projects. This finding is in line with Guillaumet's (2002) results.

Imports

The negative coefficient (-2.111571) reveals that imports have a significant and negative impact on economic growth. This can be interpreted as a consequence of Algeria's excessive reliance on consumer goods and equipment imports, combined with a low level of economic and industrial diversification. An increase in imports creates a trade imbalance and exerts pressure on foreign exchange reserves, negatively affecting economic growth. This result is consistent with the findings of (Bakari & Mabrouki, 2016).

Estimation of the VECM Model

In this Vector Error Correction Model (VECM), we have 3 variables. The results of the VECM estimation are written as follows:

D(LN_ECONOMIC GROWTH) = - 0.0478506950928.LN_ECONOMIC GROWTH(-1) + 0.961739157152.LN_EXPORTATION(-1) - 0.555484327073.LN_EXCHANGE RATE(-1) - 1.49282410893.LN_IMPORTATION(-1) - 2.74979404847) + 0.0958859056913.D(LN_ECONOMIC GROWTH(-1)) + 0.0513859379166.D(LN_ECONOMIC GROWTH(-2)) + 0.0870737962067.D(LN_EXPORTATION(-1)) - 0.129565457168.D(LN_EXPORTATION(-2)) + 0.0995703505771.D(LN_EXCHANGE_RATE(-1)) + 0.00220850066858.D(LN_EXCHANGE_RATE(-2)) + 0.137526229859.D(LN_IMPORTATION(-1)) + 0.0810512107155.D(LN_IMPORTATION(-2)) + 0.0759193116463 (2)

The error correction coefficient is -0.04785, meaning that only 4.79% of the imbalances between economic growth and its determinants (imports, exports, and exchange rate) are corrected each period. This indicates a relatively slow adjustment toward long-term equilibrium. The closer this value is to -1, the faster the adjustment. This reflects some structural inertia in the Algerian economy, where responses to economic shocks or imbalances (caused by variations in exports, imports, inflation, or the exchange rate) take time. Possible factors include:

– A low flexibility of economic policies due to complex bureaucratic processes.

– Dependency on hydrocarbons, making adjustments highly dependent on fluctuations in oil and gas prices.

– Short-term effects of the independent variables.

Short-Term Effects of Independent Variables

Exports: The positive coefficient of 0.0871 for recent exports indicates that export changes positively influence economic growth in the short term. This reflects the importance of export revenues, mainly related to hydrocarbons, in supporting economic growth in Algeria. However, the negative coefficient of -0.1296 for past exports suggests that this effect is temporarily beneficial and tends to fade quickly. This phenomenon can be explained by the volatility of oil prices, as well as the lack of export diversification into non-oil sectors, making this economic effect less stable in the long term. This result aligns with (Shihab et al., 2014).

Imports: The positive coefficients of 0.1375 and 0.0811 for recent imports show that imports stimulate economic growth in the short term. This is in line with the fact that Algeria imports a large portion of its consumer goods, industrial inputs, and equipment necessary for its development. However, this dynamic highlights the heavy dependence of the Algerian economy on imports, exposing the country to exchange rate fluctuations and potentially causing trade imbalances. These positive effects, however, are limited in time and increase economic vulnerabilities. This result is consistent with (Ali et al., 2021).

Exchange Rate: The positive coefficient of 0.0996 for the exchange rate indicates that a depreciation of the dinar could have a positive effect on economic growth in the short term by making Algerian exports more competitive in international markets. However, this effect is relatively modest and dissipates quickly, as evidenced by the coefficient of 0.0022 for past exchange rates. This suggests that the impact of devaluation is transitory, and other factors, such as rising import costs, temper its beneficial effects. This is consistent with the results of the Granger Causality Test. This result aligns with (Adeniran et al., 2014).

Constant and Dynamics of Structural Expenditures: The constant of 0.0759 in the equation represents an element of economic growth independent of variations in the other variables. This constant suggests that even in the absence of significant variations in exports, imports, or exchange rates, economic growth continues to grow slowly, supported by fixed structural expenditures. This may include:

- Civil servant salaries, which constitute a large portion of public spending.
- Massive state subsidies for basic products and energy.
- Infrastructure projects, often financed by foreign exchange reserves derived from oil revenues.

This positive constant shows that economic growth continues to grow slowly, supported by these fixed public expenditures, even in the absence of variations in economic determinants.

Stability Test of the Relationship

To implement robustness tests on the residuals, we followed the steps outlined below.

Table 7. Residual Test

Test	Statistic	P-value
Normality (Jarque-Bera)	1.517198	0.5514
Stationarity (ADF)	-2.028836	0.0419
VEC Residual correlation test	13.43054	0.6438
VEC Residual Heteroskedasticity test	185.2611	0.3784

Source: Authors' data processed (2025).

According to the results in Table 7, we observe that the residuals of our empirical model meet the four conditions: normality, stationarity, homoscedasticity, and independence of residuals.

The residuals are indeed normally distributed, as the Jarque-Bera test accepts the null hypothesis of normality (the P-value of the test is significantly higher than the 5% threshold). The ADF test on the residuals confirms their stationarity, with the critical values from Engle and Yoo (1987) (the estimated ADF value of -1.948686 is lower than the tabulated value of -2.028836). The Breusch-Pagan-Godfrey test accepts the null hypothesis of homoscedasticity and rejects the alternative hypothesis of heteroscedasticity (the P-value of the test is well above the 5% threshold). Finally, the Ljung-Box test reveals that the residuals follow white noise.

Analysis of Variance Decomposition and Impulse Response Function

Variance Decomposition Analysis

To explain the proportion of the forecast error variance of a variable, we use variance decomposition, which helps determine the share of the innovation originating from the variable itself as well as from other variables. Variance decomposition aims to analyze the impact and contribution of innovations in explanatory variables to the variance of errors. However, the issue of contemporaneous correlation of errors complicates the analysis, as the impact of a shock on a variable depends on the decomposition order, leading to asymmetric results. This complexity increases with the number of variables considered. To address this issue, the Cholesky decomposition method is applied, as it provides a structured approach to isolating the effects of shocks (Retia, 2018). Table 8 presents the results of the Cholesky variance decomposition test.

Table 8. Variance Decomposition of the Ln DEP Variable

Period	S.E.	LN ECONOMIC GROWTH	LN EXPORTATION	LN IMPORTATION	KLN EXCHANGE RATE
1	0.102733	100.0000	0.000000	0.000000	0.000000
2	0.175632	93.78955	0.368320	5.334750	0.507382
3	0.230056	81.10440	0.219016	17.23155	1.445039
4	0.275597	73.29954	0.264432	23.87428	2.561745
5	0.316883	71.01033	0.576404	25.12155	3.291710
6	0.357067	70.51722	0.796997	25.15438	3.531400
7	0.395718	69.60763	0.859582	25.85216	3.680628
8	0.431595	68.23956	0.908465	26.95101	3.900969
9	0.464589	67.11953	0.995492	27.77185	4.113131
10	0.495600	66.43973	1/086570	28.21425	4.259451

Source: Authors' data processed (2025).

Regarding imports, they account for 5.33% of the economic growth variance in the second period. Then, we observe an increase in this variable during the study period, reaching 28.21% of the economic growth variance by the end of the period. As for the exchange rate, it accounts for 0.507% of the economic growth variance in the second period, and it increases to 4.25% of the public expenditure variance by the end of the period. Thus, exports represent 0.3% of the economic growth variance in the second period, and it rises to 1.08 % by the end of the period. We conclude that the contribution of exports to the variation in economic growth is the smallest.

Impulse Response Function

Simulating structural shocks is a powerful method in the dynamic analysis of a set of variables, as it captures the time response of variables to contemporaneous shocks. This approach helps determine the influence of a shock affecting one variable on the evolution of others. In our study, we will trace the responses to shocks on the residuals of the studied variables over ten periods, which is considered the necessary time for them to return to their long-term level. All shocks are standardized to 1%, and the vertical axis indicates the approximate percentage of variance in economic growth in response to a 1% shock on other variables. This impulse response analysis provides valuable insights into how economic disturbances propagate through the system and affect interdependent variables (El Afani & Benslimane, 2017). The results of this test show the following responses (Figure 1).

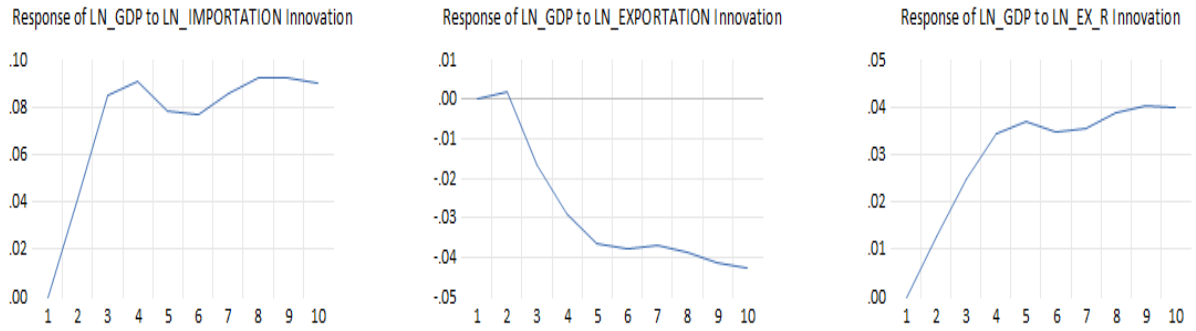

Figure 1. Impulse Response Result

Source: Authors' own research.

Importation

A positive 1% shock to imports negatively affects public spending in the short term, reaching a maximum of 0.04% in the first year. Several factors can explain this phenomenon:

– Increase in the supply of goods necessary for the local economy: Algeria imports a significant portion of its consumer goods, industrial equipment, and inputs needed for its production sector. A positive shock to imports could mean an increase in the supply of essential goods to support local industries, stimulate consumption, and thus promote immediate economic growth.

– Improvement in local production capacity: The rise in imports could enable local businesses to acquire necessary materials and machinery, improving their production capacity and boosting overall productivity. This could lead to economic expansion, particularly in sectors where imports are directly linked to industrial process improvements.

– Increased household consumption: An increase in imports can also lead to an increased supply of goods for consumers, lowering prices and improving purchasing power. This can stimulate domestic demand and thus foster short-term economic growth.

The persistence of the positive effect on economic growth, reaching 0.08% in the third year before stabilizing, can be explained by the following factors:

– Strengthening value chains: The continuous increase in imports could strengthen local value chains. For example, imported intermediate goods allow Algerian companies to produce higher-value-added goods, thereby improving their competitiveness in both domestic and foreign markets and stimulating economic activity in the medium term.

– Improvement in infrastructure and export capacity: If imports involve advanced technologies, industrial equipment, or materials needed for infrastructure, this could have a sustained positive impact on the expansion of export sectors. Over time, this openness to imports could also stimulate foreign investments, strengthening the local economy.

Stabilization of domestic demand: An increase in imports supports the supply of goods, reducing inflation and stimulating domestic demand. As a result, local businesses benefit from this dynamic and may see their sales increase, leading to sustained growth in the medium term. After about three years, the positive effect of imports on economic growth could stabilize, which may suggest that the economy has reached a certain maturity in adjusting to the new import levels. This could include economic adjustments, such as improving local competitiveness, reducing import dependence in certain sectors, or diversifying exports to higher-value-added products.

Exportation

A positive 1% shock to exports initially results in a slight increase in economic growth by 0.01%. Exports, mainly hydrocarbons, play a key role in generating foreign exchange for Algeria. A positive shock in this sector can thus temporarily strengthen foreign exchange reserves and stimulate the economy in the short term. However, given Algeria's economic structure, where exports are still largely concentrated in hydrocarbons, the immediate effect on economic growth remains relatively weak.

However, from the third year onward, a decrease in economic growth is observed, reaching -0.01%, stabilizing at -0.04% from the ninth year onward. Several factors can explain this:

– Lack of export diversification: Algeria remains highly dependent on hydrocarbons. A positive shock in this sector, without sufficient diversification of export sectors, may have limited effects on the overall economy in the medium term. If the increase in exports does not result in growth in other sectors (agriculture, manufacturing, etc.), the impact on overall economic growth may become negative in the long term.

– Volatility of hydrocarbon prices: Hydrocarbon exports are subject to global price volatility. A temporary increase in exports may not be sustainable if commodity prices drop or global demand decreases, which could negatively affect economic growth.

– The fact that the effect stabilizes at -0.04% from the ninth year onward may indicate that the Algerian economy is adjusting to this export dynamic but without significant changes in the economic structure. Dependence on oil and gas exports remains a limiting

factor, and even if exports increase, they do not generate sufficient long-term sustainable economic growth. This stabilization could also reflect an inability to diversify revenue sources and further capitalize on non-oil sectors.

Exchange Rate

A positive shock to the exchange rate generates continuous positive effects on economic growth throughout the analysis period. The initial increase is 0.01%, and it reaches 0.03% by the end of the period.

Initial moderate positive effect: The initial effect of 0.01% economic growth due to a positive shock to the exchange rate can be explained by the direct impact of an appreciation of the Algerian dinar. This can lead to a reduction in import costs, thus facilitating access to foreign goods and services at a lower cost for businesses and local consumers. Consequently, this could stimulate domestic consumption and productivity of businesses using imported inputs. A more favourable exchange rate may also enhance investor confidence in the Algerian economy and encourage foreign investments.

Positive medium- and long-term effect: The continued increase in economic growth to 0.03% by the end of the period shows that a positive shock to the exchange rate can have beneficial effects in the medium and long term. Indeed, a more competitive exchange rate can improve the competitiveness of Algerian exports as products become relatively cheaper in international markets. Although Algeria is still dependent on oil and gas exports, a stronger dinar could also have positive indirect effects on non-oil sectors if the impact on import costs enables better economic diversification.

Stability of long-term effects: The stabilization of positive effects at 0.03% by the end of the period suggests that the economy is gradually adjusting to the new exchange rate levels. Cost reductions for businesses and the stimulation of exports could lead to continuous economic growth, even if the impact of an exchange rate shock becomes more modest in the long term. This trend may also reflect a balance achieved between reducing import costs and strengthening export competitiveness, contributing to sustained but gradual growth.

CONCLUSION

Foreign trade is a key driver of economic growth in Algeria, but its effects remain mixed due to the structural characteristics of the national economy. The empirical analysis conducted over the period 1980-2023, using the Vector Error Correction Model (VECM) cointegration approach, has revealed differentiated dynamics between imports, exports, and the exchange rate in relation to economic growth. The results show that imports have a positive and significant impact on economic growth in the medium term. This is largely because Algeria imports capital goods and productive inputs that support industrialization and enhance local production capacities. However, this dependence on imports poses a long-term sustainability challenge due to the structural imbalance in the trade balance. In contrast, the impact of exports on economic growth appears to be limited and even negative in the long run. The primary reason for this is the high concentration of exports in the hydrocarbon sector, which accounts for more than 90% of export revenues. The lack of export diversification and the volatility of oil prices reduce the stabilizing effect of foreign trade on economic growth. This situation highlights the need for a structural transformation of the Algerian economic model to improve the contribution of exports to sustainable growth.

The exchange rate, on the other hand, has a generally positive influence on economic growth, particularly by facilitating access to strategic imports and improving the competitiveness of local businesses. However, prudent exchange rate management is required to avoid overvaluation, which could harm non-hydrocarbon exports and weaken the price competitiveness of Algerian products in international markets. Based on these findings, several recommendations are necessary to optimize the impact of foreign trade on economic growth in Algeria. First, a well-defined export diversification strategy is imperative. Developing competitive manufacturing industries, promoting agro-industrial products, and supporting high-value-added services should be prioritized. To achieve this, fiscal incentives and better access to financing for exporting firms must be implemented. Second, reducing dependence on imports requires strengthening domestic production, particularly in key sectors such as agriculture, manufacturing, and technology. An ambitious industrial policy supported by investments in research and development would enhance economic resilience and mitigate exposure to external shocks. Third, exchange rate management should be more flexible and aligned with competitiveness requirements. A balanced exchange rate policy should preserve macroeconomic stability while supporting emerging export sectors. Finally, greater regional and international integration would help expand market opportunities for Algerian businesses. Improving the business environment, modernizing logistical infrastructure, and simplifying customs procedures are key levers to increase foreign trade competitiveness. The impact of foreign trade on Algeria's economic growth highlights both underutilized potential and structural challenges that need to be addressed. An integrated approach – combining export diversification, gradual import substitution, exchange rate flexibility, and enhanced trade integration – is essential to transform foreign trade into a true engine of sustainable growth. Only a comprehensive economic and trade framework reform will allow Algeria to position its economy on a resilient and inclusive development trajectory, reducing its dependence on energy market fluctuations and strengthening its integration into the global economy.

The findings of this study provide practical insights for policymakers, economic decision-makers, financial institutions, and stakeholders seeking to leverage foreign trade as a catalyst for sustainable economic growth. Algeria can enhance its economic resilience and achieve long-term prosperity by adopting a comprehensive approach that combines export diversification, industrial development, flexible exchange rate policies, and trade integration.

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